IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant(s):	Papallo et al.
Serial No.:	10/662,945
For:	CIRCUIT PROTECTION SYSTEM
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Examiner:	Zoila E. Cabrera
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Commissioner for Patents
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APPEAL BRIEF FILED UNDER 35 U.S.C. §134

Dear Sir:

In response to the Notice of Panel Decision from Pre-Appeal Brief Review dated February 26, 2007, the Appeal Brief filed herewith under 35 U.S.C. §134 and 37 C.F.R. §41.37 is believed to comply with the requirements set forth in 37 C.F.R. §41.37(c).

(i) Real Party in Interest

The real party in interest is the General Electric Company. Ownership by the General Electric Company is established by assignment document recorded for this application on January 2, 2004 on Reel 014861, Frame 0459.

(ii) Related Appeals

The undersigned attorney is not aware of any related patent applications or patents involved in any appeal or interference proceeding.

(iii) Status of the Claims

Claims 1-14, 16, and 19-74 stand finally rejected in the present application. Claims 15 and 17-18 have been cancelled. Claims 1, 14, 29, 39, 51, and 62 are independent. The final rejection of claims 1-14, 16, and 19-74 is hereby appealed

(iv) Status of Amendments

No amendments after final were filed in the present application. However, Appellants filed a Request for Reconsideration after final, which was considered by the Examiner.

(v) Summary of claimed subject matter

The claimed invention relates generally to methods for protecting circuits (claims 1 and 14), protection systems (claims 29 and 39) utilizing such methods, and power distribution systems (claims 51 and 62) utilizing such methods.

Advantageously, the claimed methods and systems provide dynamic zone protection. As a non-limiting example of adjusting a zone protective function for the zone, Appellants' specification describes:

> In an exemplary embodiment, protection system 26, can perform dynamic zone protective functions for the zones of protection of power distribution system 105. The dynamic operation of system 26, and its capability of adjusting the zone protection functions, including, but not limited to, the algorithms and/or the coefficients associated with the algorithms, accounts for changes in the topology within the zone of protection, as well as throughout the entire circuit. See paragraph

[0089].

As a further non-limiting example, Appellants' specification describes application of the claimed methodology and the claimed systems with use of bus differential as the zone protective function based upon a change to the zone of protection as shown in FIGS. 9 and 10. Here, Appellants' specification describes the non-limiting example of the adjusting of the zone protective function as follows:

> If the configuration of power distribution system 105 were changed by closing tie CB 1070 (as shown in FIG. 10), then the tie CB would be a power sink of zone 1095. Again applying equation one to zone 1095 where tie CB 1070 is now closed, provides a bus differential function defined by equation three:
>
> $$i_r = i_{main\text{-}1} - (i_{feeder\text{-}1} + i_{feeder\text{-}2} + i_{tie})$$
>
> where $i_{main\text{-}1}$ is the current at main-1 CB 1015, $i_{feeder\text{-}1}$ is the current at feeder-1 CB 1020, $i_{feeder\text{-}2}$ is the current at feeder-2 CB 1025 and i_{tie} is the current at tie CB 1070. CCPU 28 has all of the information for the device status available to it at the same time as all of the information for the current. Based upon the state or topology of power distribution system 105, and, in particular, the state or topology within zone 1095 with tie CB 1070 now closed, CCPU can apply equation three for determining the residual current within the zone. The ability for CCPU 28 to have the state information at the same time as the current, allows CCPU 28 to apply the correct algorithm for the bus differential protection function, and avoids application of the erroneous equation two causing a false trip within zone 1095. The protection function can continue effectively uninterrupted to provide the same protection to the new state, topology or configuration within zone 1095. See paragraph [0094].

Advantageously, the claimed zone protective function itself is adjusted based at least in part upon the topology or changes to the topology. Such adjustment prevents use of erroneous algorithms resulting from the different configuration of the circuit.

Independent claims 1 and 14 are each directed to a method of protecting a circuit (105). The method of claim 1 includes: monitoring a zone of protection (595, 895, 896, 995, 1095, 1195) of the circuit to determine a first topology; adjusting a zone protective function for said zone of protection based at least in part upon changes to said first topology, said zone protective function detecting a fault in said zone of protection; and

performing said zone protective function on said zone of protection to detect said fault. Similarly, the method of claim 14 includes: monitoring the circuit (105) to determine a first topology; defining a zone of protection (595, 895, 896, 995, 1095, 1195) for at least a portion of the circuit based at least in part upon changes to said first topology; performing a zone protective function on said zone of protection to detect a fault; monitoring a second topology for said zone of protection; and adjusting said zone protective function based at least in part upon changes to said second topology.

Independent claim 29 is directed to a protection system (26) for coupling to a circuit (105) having a circuit breaker (14, 415, 420, 425, 700, 715, 720, 725, 1015, 1016, 1020, 1021, 1025, 1026, 1070). The system includes: a control processing unit (28) being communicatively coupleable to the circuit so that said control processing unit can monitor a topology of the circuit, said control processing unit defining a zone of protection (595, 895, 896, 995, 1095, 1195) for at least a portion of the circuit based at least in part upon said topology, and said control processing unit redefining said zone of protection based at least in part upon changes to said topology, wherein said control processing unit adjusts a zone protective function for said zone of protection based at least in part upon changes to said topology, said zone protective function detecting a fault in said zone of protection.

Independent claim 39 is directed to a protection system (26) for coupling to a circuit (105) having a zone of protection (595, 895, 896, 995, 1095, 1195) and a circuit breaker (14, 415, 420, 425, 700, 715, 720, 725, 1015, 1016, 1020, 1021, 1025, 1026, 1070). The system includes: a control processing unit (28) being communicatively coupleable to the circuit so that said control processing unit can monitor a topology of the zone of protection, said control processing unit adjusting a zone protective function for the zone of protection based at least in part upon said topology, and said control processing unit performing said zone protective function to detect a fault in the zone of protection.

Independent claims 51 and 62 are each directed to a power distribution system

(10). The system of claim 51 includes: a circuit (105) and a control processing unit (28) communicatively coupled to said circuit, wherein said control processing unit determines a topology of said circuit, wherein said control processing unit defines a zone of protection (595, 895, 896, 995, 1095, 1195) for at least a portion of said circuit based at least in part upon said topology, wherein said control processing unit redefines said zone of protection based at least in part upon changes to said topology, and wherein said control processing unit adjusts a zone protective function for said zone of protection based at least in part upon changes to said topology, said zone protective function detecting a fault in said zone of protection.

Similarly, the system of claim 62 includes: a circuit (105) having a zone of protection (595, 895, 896, 995, 1095, 1195) and a control processing unit (28) being communicatively coupled to said circuit, wherein said control processing unit monitors a topology of said zone of protection, wherein said control processing unit adjusts a zone protective function for said zone of protection based at least in part upon said topology, and wherein said control processing unit performs said zone protective function to detect a fault in said zone of protection.

(vi) Grounds of rejection to be reviewed on appeal

The sole issue presented for review is the propriety of the final rejection of independent claims 1, 29, 39, 51, and 62 under 35 U.S.C. §102(b) over U.S. Patent No. 5,568,399 to Sumic (Sumic). Dependent claims 3-4, 6-11, 30-37, 40-46, 49, 52-58, 60, 63-69, and 71 were also finally rejected under 35 U.S.C. §102(b) over Sumic. Dependent claims 12-13, 47-48, and 72-73 were rejected under 35 U.S.C. §103 over Sumic in view of U.S. Publication No. 20050251296 to Nelson et al. (Nelson). Dependent claims 27-28 were rejected under 35 U.S.C. §103 over Sumic in view of U.S. Patent No. 6,728,205 to Finn (Finn) in further view of Nelson.

(vii) Arguments

The Final Office Action and the Advisory Action assert that Sumic discloses adjusting a zone protection function. Appellants submit this assertion is clearly erroneous. Rather, Appellants submit that Sumic merely discloses maintaining and updating the order or schema in which the protective devices operate. However, Appellants submit that adjusting the order or schema as in Sumic simply does not disclose or suggest adjusting the zone protective function itself, which is an adjustment of how the protective devices operate, as claimed by the present application.

(a) Claims 1-14, 16, and 19-74 stand or fall together

Independent claim 1 recites, in part, the step of "adjusting a zone protective function for said zone of protection based at least in part upon changes to said first topology (emphasis added)".

The present application discloses that: "The dynamic operation of system 26, and its capability of adjusting the zone protection functions, including, but not limited to, the algorithms and/or the coefficients associated with the algorithms, accounts for changes in the topology within the zone of protection, as well as throughout the entire circuit. See paragraph [0088].

Thus, claim 1 adjusts the zone protective function itself based at least in part upon changes to the first topology.

In contrast, Sumic discloses a digraph 64, referring to FIG. 4A, illustrating protective devices (P1, P2, P3, et cetera). The resulting protective device schema relates to the order in which the protective devices would operate in case of a fault, and the associated backup protective device upstream from each operated protective device that may successively operate to minimize loss of overall power distribution grid integrity. Referring to FIG. 4B, Sumic discloses a data structure 66 representing the

protective device schema of digraph 64 utilized in the outage determination program. In other words, by upstream tracing using data structure 66, it can be determined that the backup for protective device P7 is protective device P6, whose backup is in turn protective device P3, and so on. The protective device schema data structure 66 is dynamically maintained and updated following any changes to the distribution system functional topology during the operation of the power distribution system. See col. 6, lines 31-61.

Clearly, Sumic merely dynamically maintains and updates the schema (i.e., the order of the protection devices in the system). However, Sumic simply fails to disclose or suggest adjusting the zone protective function itself based at least in part upon changes to said first topology as recited by claim 1.

The Office Action fails to assert that Sumic, alone or in combination with Finn and/or Nelson, disclose or suggest claim 1.

Therefore, independent claim 1, as well as claims 2-13 that depend therefrom, are believed to be in condition for allowance over Sumic alone or in combination with the Nelson and/or Finn.

Independent claim 14 recites, in part, the step of "adjusting said zone protective function based at least in part upon changes to said second topology". Independent claim 29 is directed to a protection system that requires, in part, a control processing unit that "adjusts a zone protective function for said zone of protection based at least in part upon changes to said topology". Similarly, independent claim 39 is also directed to a protection system that requires, in part, a control processing unit "adjusting a zone protective function for the zone of protection based at least in part upon said topology".

Independent claims 51 and 62 are each directed to a power distribution system that requires a control processing unit. In claim 51 the control processing unit "adjusts a zone protective function for said zone of protection based at least in part upon changes

to said topology", while in claim 62 the control processing unit "adjusts a zone protective function for said zone of protection based at least in part upon said topology".

As discussed in detail above with respect to claim 1, Sumic merely dynamically maintains and updates the schema (i.e., the order of the protection devices in the system) and therefore fails to disclose or suggest the control processing unit that adjust a zone protective function in the manner recited by independent claims 14, 29, 39, 51, or 62.

The Office Action fails to assert that Sumic, alone or in combination with Finn and/or Nelson, disclose or suggest claims 14, 29, 39, 51, and 62.

Therefore, independent claims 14, 29, 39, 51, and 62, as well as claims 16, 19-28, 30-38, 40-50, 52-61, and 63-74 that depend therefrom, are believed to be in condition for allowance over Sumic alone or in combination with the cited art.

(b) Summary

Accordingly, Appellants respectfully submit that Sumic alone or in combination with the cited art does not disclose or suggest any of pending claims 1-14, 16, and 19-74. Appellants therefore respectfully request that the Board of Appeals reverse the final rejection of claims 1-14, 16, and 19-74 and pass the present application to issuance.

Respectfully submitted,

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(viii) Claims Appendix

Claims 1-14, 16, and 19-74, herein on appeal, are set forth below.

Claim 1. A method of protecting a circuit comprising:

monitoring a zone of protection of the circuit to determine a first topology;

adjusting a zone protective function for said zone of protection based at least in part upon changes to said first topology, said zone protective function detecting a fault in said zone of protection; and

performing said zone protective function on said zone of protection to detect said fault.

Claim 2. The method of claim 1, further comprising:

determining a second topology of the circuit based at least in part upon a state for each of a plurality of power switching devices in the circuit, said state being either opened or closed; and

defining said zone of protection based at least in part upon said second topology.

Claim 3. The method of claim 1, further comprising determining said first topology based at least in part upon a state for each of a plurality of power switching devices in said zone of protection, said state being either opened or closed.

Claim 4. The method of claim 3, further comprising opening at least one of said plurality of power switching devices in said zone of protection based at least in part upon said zone protective function.

Claim 5. The method of claim 4, further comprising:

determining a dynamic delay time for opening said at least one of said plurality of power switching devices in said zone of protection; and

opening said at least one of said plurality of power switching devices in said zone of protection after said dynamic delay time has elapsed.

Claim 6. The method of claim 3, further comprising:
monitoring electrical parameters of said zone of protection; and
communicating said electrical parameters over a network to a microprocessor.

Claim 7. The method of claim 6, wherein said microprocessor applies an algorithm to said electrical parameters to perform said zone protective function.

Claim 8. The method of claim 7, wherein said microprocessor uses a coefficient of said algorithm in applying said zone protective function, and wherein said microprocessor adjusts said coefficient based at least in part upon said changes to said first topology.

Claim 9. The method of claim 6, wherein said microprocessor is configured to operate each of said plurality of power switching devices in said zone of protection.

Claim 10. The method of claim 6, further comprising generating an open command by said microprocessor in response to said electrical parameters, communicating said open command from said microprocessor to an actuator operably connected to at least one of said plurality of power switching devices, and opening said at least one of said plurality of power switching devices in response to said open command.

Claim 11. The method of claim 6, further comprising sensing said electrical parameters with a sensor, communicating signals representative of said electrical parameters to a module, and communicating said signals to said microprocessor, wherein said module, said sensor and said microprocessor are communicatively coupled.

Claim 12. The method of claim 11, further comprising:

monitoring said sensor to detect an error in sensing said electrical parameters; and

adjusting said zone protective function based at least in part upon the detection of said error.

Claim 13. The method of claim 11, further comprising:

monitoring said module to detect an error in communicating said signals to said microprocessor; and

adjusting said zone protective function based at least in part upon the detection of said error.

Claim 14. A method of protecting a circuit comprising:

monitoring the circuit to determine a first topology;

defining a zone of protection for at least a portion of the circuit based at least in part upon changes to said first topology;

performing a zone protective function on said zone of protection to detect a fault;

monitoring a second topology for said zone of protection; and

adjusting said zone protective function based at least in part upon changes to said second topology.

Claim 16. The method of claim 14, further comprising determining said first topology based at least in part upon a state for each of a plurality of power switching devices in said circuit, said state being either opened or closed.

Claim 19. The method of claim 14, further comprising:

determining said first topology based upon a state for each of a plurality of power switching devices in the circuit, said state being either opened or closed; and

opening at least one of said plurality of power switching devices based at least in part upon said zone protective function.

Claim 20. The method of claim 19, further comprising:

determining a dynamic delay time for opening said at least one of said plurality of power switching devices; and

opening said at least one of said plurality of power switching devices after said dynamic delay time has elapsed.

Claim 21. The method of claim 19, further comprising:

monitoring electrical parameters of the circuit; and

communicating said electrical parameters over a network to a microprocessor.

Claim 22. The method of claim 21, wherein said microprocessor applies an algorithm to said electrical parameters to perform said zone protective function.

Claim 23. The method of claim 22, wherein said microprocessor uses a coefficient of said algorithm in applying said zone protective function, and wherein said microprocessor adjusts said coefficient based at least in part upon said changes to said first topology.

Claim 24. The method of claim 21, wherein said microprocessor is configured to operate each of said plurality of power switching devices.

Claim 25. The method of claim 24, further comprising generating an open command by said microprocessor in response to said electrical parameters, communicating said open command from said microprocessor to an actuator operably connected to said at least one of said plurality of power switching devices, and opening said at least one of said plurality of power switching devices in response to said open command.

Claim 26. The method of claim 21, further comprising sensing said electrical parameters with a sensor, communicating signals representative of said electrical parameters to a module, and communicating said signals to said microprocessor, wherein said module, said sensor and said microprocessor are communicatively coupled.

Claim 27. The method of claim 26, further comprising:

monitoring said sensor to detect an error in sensing said electrical parameters; and

adjusting said zone protective function based at least in part upon the detection of said error.

Claim 28. The method of claim 26, further comprising:

monitoring said module to detect an error in communicating said signals to said microprocessor; and

adjusting said zone protective function based at least in part upon the detection of said error.

Claim 29. A protection system for coupling to a circuit having a circuit breaker, the system comprising:

a control processing unit being communicatively coupleable to the circuit so that said control processing unit can monitor a topology of the circuit, said control processing unit defining a zone of protection for at least a portion of the circuit based at least in part upon said topology, and said control processing unit redefining said zone of protection based at least in part upon changes to said topology, wherein said control processing unit adjusts a zone protective function for said zone of protection based at least in part upon changes to said topology, said zone protective function detecting a fault in said zone of protection.

Claim 30. The system of claim 29, further comprising a network in communication with said control processing unit and the circuit.

Claim 31. The system of claim 29, wherein said control processing unit operatively controls the circuit breaker.

Claim 32. The system of claim 31, wherein said control processing unit receives parameter signals representative of electrical parameters of the circuit, and wherein said control processing unit opens the circuit breaker in response to said parameter signals if said fault is detected in the circuit.

Claim 33. The system of claim 32, wherein said control processing unit applies an algorithm to said electrical parameters to perform said zone protective function on said zone of protection.

Claim 34. The system of claim 33, wherein said control processing unit uses a coefficient of said algorithm in applying said zone protective function, and wherein said control processing unit adjusts said coefficient based at least in part upon said changes to said topology.

Claim 35. The system of claim 32, wherein said electrical parameters further comprise a state of the circuit breaker, said state being either opened or closed, and wherein said topology is monitored by said control processing unit based at least in part upon said state of the circuit breaker.

Claim 36. The system of claim 32, further comprising a module and a sensor, said module being in communication with the circuit breaker, said sensor and said control processing unit, wherein said sensor senses said electrical parameters and communicates said parameter signals to said module, and wherein said module communicates said parameter signals to said control processing unit.

Claim 37. The system of claim 36, further comprising a circuit breaker actuator in communication with said control processing unit, wherein said circuit breaker actuator receives an actuation signal from said control processing unit, said actuation signal causing said circuit breaker actuator to open the circuit breaker.

Claim 38. The system of claim 37, wherein said control processing unit determines a dynamic delay time for opening the circuit breaker, and wherein said actuation signal causes said circuit breaker actuator to open the circuit breaker after said dynamic delay time has elapsed.

Claim 39. A protection system for coupling to a circuit having a zone of protection and a circuit breaker, the system comprising:

a control processing unit being communicatively coupleable to the circuit so that said control processing unit can monitor a topology of the zone of protection, said control processing unit adjusting a zone protective function for the zone of protection based at least in part upon said topology, and said control processing unit performing said zone protective function to detect a fault in the zone of protection.

Claim 40. The system of claim 39, further comprising a network in communication with said control processing unit and the circuit.

Claim 41. The system of claim 39, wherein said control processing unit operatively controls the circuit breaker.

Claim 42. The system of claim 41, wherein said control processing unit receives parameter signals representative of electrical parameters of the circuit, and wherein said control processing unit opens the circuit breaker in response to said parameter signals if said fault is detected.